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Incidence of Covid-19 among children in Bogota during the period July and November, 2020

Incidence of Covid-19 among children in Bogota.

Incidencia de síntomas respiratorios agudos y covid-19 en niños de Bogotá, Colombia

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Contribución de los autores:

José Moreno-Montoya, Diana Benavides-Arias y Fernando de La Hoz: diseño y concepción del artículo.

Jennifer Ruiz, Deidamia García, Iván Osejo y Edwin Ussa: recolección de información.

Todos los autores participaron en el análisis de la información y la discusión.

Introduction: Incluir

Objective: Estimate the incidence of acute respiratory symptoms and Covid-19 in children from public schools in Bogotá Colombia during second semester of 2020.

Materials and methods: Telephone survey conducted in over 5000 scholar children. Antecedents and use of health services were informed. Descriptive statistics were used.

Results: A total of 151470 persons-day were accounted for an incidence rate of 157.8 x 100000 people, almost three times the reported by official surveillance system in the city.

Conclusion: Lacks in diagnosis and consultation in children were found when compared to general population. Further research is needed to elucidate the true burden of disease among children.

Keywords: Coronavirus infections; respiratory tract infections; communicable diseases; epidemiology; surveillance; adolescent; child**.**

Introducción: Incluir

Objetivo. Estimar la incidencia de síntomas respiratorios agudos y Covid-19 en niños de escuelas públicas de Bogotá Colombia durante el segundo semestre de 2020.

Materiales y métodos. Encuesta telefónica realizada en más de 5000 escolares. Se recolectó información de antecedentes médicos y uso de servicios de salud. Se utilizó estadística descriptiva.

Resultados. Se contabilizaron un total de 151.470 personas-día para una tasa de incidencia de 157,8 x 100.000 personas, casi tres veces lo reportado por el sistema de vigilancia oficial de la ciudad.

Conclusión. Se encontraron deficiencias en el diagnóstico y la consulta en los niños al compararlos con la población general. Se necesita más investigación para dilucidar la verdadera carga de enfermedad en la población infantil.

Palabras clave: infecciones por coronavirus; infecciones del sistema respiratorio; enfermedades transmisibles; epidemiología; vigilancia; adolescente; niño.

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It is estimated that children accounted for up to 15.7% of the total of COVID-19 infections around the world with >90% of them developing mild to moderate disease (1). In Colombia, during 2020, COVID-19 infections stayed below 9.2% of the total cases with no trends by age group or sex. For the country, mild, and asymptomatic cases accounted for 96.2% of the infections with a death proportion of 0.16% (2). Despite the figures showing that SARSCoV-2 infection seems to be less frequent and less severe in children (3) actions designed to control the spread of the virus has required radical changes in children's normal lifestyles including temporary shutdown of schools. However, it is partially unknown at what extent schools closing has protected children because there is no specific data on the incidence of SARS-CoV-2 infection for this population and national figures are based on general-population-based studies, especially in developing countries (4). Here, we described the incidence of Covid-19 infection among children enrolled in the public education system of Bogota, a large metropolitan area in Latin America (5), that closed schools in March 2020.

Materials and methods

Settings. Bogotá is the capital and major city of Colombia with an estimated population of >7 million inhabitants, 31% minors (6). A telephone survey was conducted in 2020 between August 11th and November 30th, among a fully random without replacement sample of students inscribed to the Bogota's public education system which served a population of >800,000 students, 62% of the scholar population of the city. According to official figures, 10% of them in preschool, 44% in primary, 30% in secondary and 7% in adult programs. 51.52% of the scholar population are females. Annually the student population in the city has been

decreased by a constant pace of 0.22%. 87.8% of the persons in the public school systemin Bogotá comes from low or middle-low-income groups (7). The population included in this study was not filtered by special selection criteria, so any child ascribed to the public education system could be part of the sample.

An expected sample of n=4784 persons was estimated (maximum error=0.03, prevalence=0.5) using as a sampling frame the official total list of students ascribed to public schools of the city in January 2020; it is expected more than 99% of the students or caregivers in Bogotá are expected to have an active phone line at the time of this study (5). The survey was part of routine promotion activities conducted by the Bogota's Secretary of Education which includes activities for promotion of health and illness prevention, academic remote assistance for the students and virtual meetings with parents and caregivers (5). Therefore, it does not require ethical committee approval, but verbal consent was obtained from caretakers.

We gathered information about antecedents of respiratory symptoms, use of health services, COVID-19 diagnosis in the last month, age, gender, and antecedents of household contact with COVID-19 cases or deaths. No active surveillance was carried out, so the children were only tested as ordered by their insurer. All data was consolidated in an anonymized database. For children under 12 years old, responses were given by the caregiver or parent registered in the database. Children of 12 or more, answered the interview personally, but assisted by their parents in all cases.

Data Analysis. We estimated the study's incidence rate (IR) of COVID-19 like illness and confirmed cases per child-day under observation. To obtain the denominator of the incidence rate, we assume that every participant in the sample

contributes 30 days of observation and that number was added for each student interviewed yielding 151,470 persons-days of follow up, so analysis period is from July 12 to November 30, 2021. To do that, every person/caregiver interviewed was asked to provide information regarding respiratory symptoms or Covid-19 during the last 30 days.

Also, we estimated the Bogota's IR for Covid-19 confirmed cases using data from the city's surveillance system. There were 1,486,719 people aged 3 to 17 years old living in Bogota during the 111 days of the study period, yielding 165,025,809 persons-day of follow up.

Confidence intervals (95%CI) for the rates were estimated using a Poisson approximation to the normal distribution.

Results

A total of 5049 students were included in the sample (rejection proportion was lower than 20% including wrong numbers; no additional information was gathered on rejections). Age ranged from 3 to 17 years (average 10.56 years, CI95% 10.51-10.61) and 50.58% were males. Acute respiratory symptoms in the last month were reported by 239 participants for an IR of 157.8 cases per 10^5 persons day (95%CI 138.4-179.1 per 10^5 person-days), however, among symptomatic only 45 people (18.81%) consulted to health services, i.e., only 18.82% of the total of children who seemed to be ill search for medical assistance (table 1).

In total, 239 children were tested for COVID-19 infection using a molecular test. Testing was performed by the surveillance system of the Bogota Health Secretary. The reason to be tested included: being a household contact of a confirmed case (n=118); being symptomatic (n=24); for unknown reason (n=97). 60 out of 239

(25.1%, 95%CI 19.74-31.52%) were positive which yielded an incidence rate of 39.61 cases per 10^5 person-days (95%CI 30.23-50.99 per 10^5 person-days). Table 2 shows the monthly incidents of Acute Respiratory Disease and Covid-19 for children. No severe disease, hospitalization or deaths were reported.

In Bogota, the surveillance system detected 24,878 cases for the same age group during the study period (IR: 15.1 cases per 10^5 person-days, 95%CI 14.89-15.26 per 10^5 person-days) which was 61.87% lower than the estimated from the survey.

Discussion

This is one of the few studies, if any, reporting on the incidence of COVID-19 among children using a population-based survey. The main finding is that children and adolescents, remaining at home because schools closing, are not at zero risk of COVID-19 infection. In fact, the incidence among them was 2.62 times bigger than the incidence reported by the city's surveillance system for the general population in the same age group and period.

These results put in question the effectiveness of school closure to protect children from COVID-19 infection and alerts to the need for surveillance to another related problems derived from schools closing regarding their mental health, decrease in physical activity, dietary changes, and social performance difficulties (8). On the other hand, it showed a potential important underestimation of COVID-19 infection among children and adolescents in Colombia given the low number of people who received the test even if symptomatic (24/239: 10.01%). Likewise, only 42.67% of children living with COVID-19 positive adults were tested adding to the underestimation proportion. Besides the fact that unexplored barriers for access to health services and molecular testing contributes substantially to underestimation

(5), this finding could be associated to the fact that during pandemics the screening efforts were concentrated to elderlies and morbid people. In addition, underrepresented minorities, immigrants, and low-income families could had been disproportionally affected by Covid-19 pandemics getting worse the living and health conditions of school-age children (9).

No severe disease was reported in our survey which is consistent with the low risk of complications reported by the global literature for this age group. However, despite that in children the infection is milder, the prognosis is better, and the mortality rate is lower compared to adult patients, children are potential carriers and can transmit the infection among the entire population. Regarding the above, between age groups (<14 and 14+) the positivity proportion of COVID-19 tests was similar, alike as the number of children living with somebody diagnosed for COVID-19, however, the proportion of tests administered for each group was different, what reveals a different level of priorization in the surveillance reach at moment where is not completely clarified the role of the children about transmission. Early identification and intervention in pediatric patients with COVID-19 are essential to control the pandemic. Moreover, surveillance of other symptoms, like gastrointestinal or psychological ones, which are common among children are required.

Further research is needed to elucidate the true burden of disease among children and the extent of the damage associated to the school's closure and lockdown measures aimed to control the spread of the SARS-Cov-2 virus. New public health strategies for diagnosing and reduce the spread of the virus in children and adolescents are required aimed to diminish the potential of transmission

underestimated in this population as well as to prevent collateral damages in other populations than those at risk. In addition to the demands of homeschooling, families in Bogotá need to be thought to meet the additional and often complex educational and medical needs of their children regarding the new normality in pandemic times.

Competing interests

None declared.

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References

1. Bhuiyan MU, Stiboy E, Hassan Z, Chan M, Islam S, Haider N, et al. Epidemiology of COVID-19 infection in young children under five years: A systematic review and meta-analysis. Vaccine. 2021;39:667-77. https://doi.org/10.1016/j.vaccine.2020.11.078

2. Bolaños-Almeida CE, Espitia Segura OM. Clinical and epidemiologic analysis of COVID-19 children cases in Colombia PEDIACOVID. Pediatr Infect Dis J. 2021;40:e7-e11. https://doi.org/10.1097/INF.0000000000002952

3. Masih M, Moll S, Raza N. Paediatric case of prolonged COVID-19 manifesting as PMIS-TS and atypical Kawasaki. BMJ Case Rep. 2020;13:e237194. https://doi.org/10.1136/bcr-2020-237194

4. Riphagen S, Gomez X, Gonzalez-Martinez C, Wilkinson N, Theocharis P. Hyperinflammatory shock in children during COVID-19 pandemic. Lancet. 2020;395:1607-8. https://doi.org/10.1016/S0140-6736(20)31094-1

5. Secretaría de Educación de Distrito. La educación en primer lugar. Eventual Reapertura Segura y Progresiva del sistema educativo en Bogotá D.C. Informe de avances y análisis para la toma de decisiones. Bogotá, D.C.: Secretaría de Educación de Distrito; 2020.

6. Departamento Administrativo Nacional de Estadística. Censo Nacional de Población y Vivienda 2018, Colombia. Cuantos Somos. Bogotá, D.C.: DANE; 2018.

7. Secretaría de Educación de Distrito. Caracterización del sector educativo año 2017. Bogotá, D.C.: Secretaría de Educación de Distrito; 2017.

8. Myhr A, Naper LR, Samarawickrema I, Vesterbekkmo RK. Impact of COVID-19 pandemic lockdown on mental well-being of Norwegian adolescents during the first wave—socioeconomic position and gender differences. Front Public Health. 2021;9:717747. https://doi.org/10.3389/fpubh.2021.717747

9. Vilar-Compte M, Gaitán-Rossi P, Félix-Beltrán L, Bustamante AV. "Pre-COVID-19 social determinants of health among Mexican migrants in Los Angeles and New York City and their increased vulnerability to unfavorable health outcomes during the COVID-19 pandemic. J Immigr Minor Health. 2021;1-13. https://doi.org/10.1007/s10903-021-01283-8

Table 1. Symptoms and Covid-19 incidence

Symptoms[a]	Under 14 years old N=3674 (n) %	14+ years old N= 1375 (n) %	Total (P value)
Last month respiratory symptoms	182 (4.95)	57 (4.14)	4.73% (0.25)
In symptomatic children: Last month medical consultation from respiratory symptoms /people who attended medical consultation last month.	34/182 (18,68)	11/57 (19,29)	18.82% (0.93)
In symptomatic children: COVID-19 tests	15/182 (8.24%)	9/57 (15.79%)	10.04% (0.14)
Children with symptoms last month	n=182	n=57	n=239
Cough	14	1	
Fever	4	1	
Nasal congestion	19	7	
Respiratory distress	17	7	
Chest pain	1	2	
General discomfort	4	2	
Excessive tiredness	1	2	
Has had any contact with a COVID-19 patient?	229/3674 (6.23%)	92/1375 (6.69%)	6.35% (0.57)
If yes, the child was tested?	78/229 (34.06%)	40/92 (43.47%)	36.76% (0.28)
Does the child live with some COVID-19 patient?	176/3674 (4.79%)	63/1375 (4.65%)	5.75% (0.84)
If yes, the child was tested?	72/176 (40.9%)	30/63 (46.87%)	42.67% (0.56)
Somebody in your family has died from COVID-19?	114/3674 (3.1%)	33/1375 (2.4%)	2.91% (0.19)
COVID-19 Tests (Total)	151/3674 (4.1%)	88/1375 (6.4%)	4.73% (0.01)
Positives	37/151 (24.5%)	23/88 (26.13%)	25.1% (0.82)

[a] Not all the respondents answered the symptoms questions and those who answered could choose one or more options.

Table 2. Monthly incidence of ARS and COVID-19 among children during the period July and November 2020 per 10^5 persons day.

Month	Cases ARS	Cases COVID-19	Persons at risk	IR-ARS*	IR-COVID-19**	n
July	35	1	17580	199.09	5.69	586
August	75	8	51810	144.76	15.44	1727
September	145	24	79920	181.43	30.03	2664
October	196	34	113940	172.02	29.84	3798
November	239	60	151470	157.79	39.61	5049

* Incidence rate of Acute Respiratory Symptoms

** Incidence rate COVID-19